

## **CSIG PRIORITY ISSUES**

### **June 1999**

#### **Issue Set A: \*Chemical Safety “Drivers” (Integrating Chemical Safety and Nuclear Safety)** **[Original Issues 1-1 + 1-2 + 2-3 + 8-1]**

**\*Formerly: “Chemical Safety as a part of Integrated Safety Management (ISM)”**

##### **Issue A.1 (Original 1-1):**

**DOE Chemical Safety Guide (Includes original 1-2 “Management Priorities” and 2-3 “Management of Chemical Safety Basis”)**

##### **Champion:**

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##### ***Description of Issue:***

Chemicals are an integral part of many operations Conducted at the Department of Energy (DOE), yet DOE’s current guidance for Integrated Safety Management (ISM) does not specifically address chemical safety.

Lack of clear DOE guidance for integrated safety management of chemical activities at DOE sites is likely to result in ISM systems and their implementation that inadequately manage chemical hazards. Of special concern are chemical hazards that are not covered by the Process Safety Management (PSM), Risk Management Plan (RMP), or Laboratory Safety rules. Many DOE chemical operations are not covered by these requirements. Questions of adequate resources, well-implemented management processes, needed documentation, a defined process for chemical work authorization agreements, and trained staff for the proper planning, analysis, control, and conduct of chemical work, need to be answered via a fully coordinated guide. A guide is needed to provide information, procedures, and tools related to safety management of chemical hazards. A Chemical Safety Guide is needed in the framework of ISM to adequately protect the public and workers.

**Champion’s Statement:** A chemical safety guide needs to be developed that references existing processes, methods, and tools that may be useful for improving ISM systems across the DOE complex. This guide will focus on tailoring existing safety requirements and best practices adopted by the most responsible companies in the commercial chemical industry for those situations where chemical hazards are not covered by regulations.

The first step is to make an annotated outline of the draft guide’s proposed contents for review by CSO, ISM coordinators, and site DOE and contractor representatives. This will serve as the framework for subsequent addition of necessary details and information.

Instead of preparing an outline, Dick Englehart has prepared a draft chemical safety order with a small core writing group. He has now consolidated those comments.

The amendments to the order are intended to ensure DOE Elements prepare a Safety Basis Report that establishes the safety basis by which DOE will authorize operations of hazardous chemical facilities. The safety basis will consist of a hazards analysis of the facility, identification of controls necessary for safe operation and prevention and mitigation of potential accidents, and a management of change process to assure the safety basis remains valid. Hazardous chemical facilities are defined as those with chemical inventories of one-tenth or more of the threshold values of 29 CFR 1910.119 or of 40 CFR 68, whichever is smaller (or equivalent hazard level for chemicals not listed in that regulation-to be determined on a case-by-case basis, locally). Mixtures and aqueous solutions shall be treated as in 40 CFR 68, subject to the one-tenth threshold criterion.

As of this update the below draft order for chemical facilities has been developed for the CSIG Issue 1-1 Team's review and comment:

Proposed, to add a new section 4.5 to DOE O 420.1 Facility Safety, entitled Hazardous Chemical Facility Safety Basis Reports. The new section would be as shown in the following paragraphs. (REV 1, 4/29/99)

#### **4.5 Hazardous Chemical Facility Safety Basis**

##### **4.5.1 Objectives**

It is intended that DOE hazardous chemical facilities are designed, constructed, and operated so that the public, workers, and the environment are provided with an adequate level of protection from the hazards of the facilities. In accordance with the core functions of Integrated Safety Management to analyze hazards and establish controls, and consistent with chemical industry best practice, this Section specifies Department of Energy expectations for establishing and maintaining a hazardous chemical facility safety basis. It is expected that the requirements of this Section will be met through application of process safety management in a graded fashion, and through operations of covered facilities in accordance with the established safety basis. Facilities that have hazardous chemical inventories in excess of the threshold quantities specified in 29 CFR 1910.119 or in 40 CFR 68 are required to implement the requirements of those regulations. The hazards analyses required as part of those regulations are sufficient to comply with the hazards analysis requirements of this Section and should be documented in a Safety Basis Report as described in this Section.

##### **4.5.2 Requirements**

Contractors shall:

- (1) Establish and document a safety basis for the facility in a Safety Basis Report, including the operations and activities conducted therein, by performing hazards analyses and deriving safety controls to provide an adequate level of safety to the public, workers, and the environment. Safety controls shall specify (i) the safety structures, systems and components and (ii) management, organization, and institutional safety provisions (including appropriate safety management programs) necessary for safe operations.
- (2) Identify and document safety controls that specify chemical safety requirements relating to the maintenance and operability requirements for safety structures, systems and components and administrative controls including commitments to the safety management programs identified as necessary for safe operations. These controls shall be based on the hazards analyses.

- (3) Operate the facility and conduct the operations and activities in accordance with the documented and approved Safety Basis Report and controls documented therein.
- (4) Establish and maintain a Management of Change (MOC) process. The MOC process shall identify proposed changes that could (i) increase the likelihood of an accident or the malfunction of safety structures, systems or components; (ii) increase the consequences of an accident previously evaluated; (iii) create the possibility of an accident or malfunction of a different type than previously evaluated; or (iv) reduce any margin of safety as defined in safety control documents. The process shall also provide for resolution of potential inadequacies which are discovered with respect to the hazards analysis that supports the current safety basis, and for discovery of conditions that render the current safety basis invalid. A hazards analysis of proposed changes or deficiencies in the current safety basis shall be performed to demonstrate that the change is safe or to correct the deficiency. Safety Basis Report changes should be identified for each proposed change that is adopted and implemented. DOE shall be notified of any changes identified through this process, and such changes shall be part of the safety basis and shall be included in updates to the Safety Basis Report.

#### **4.5.3 Documentation**

- (1). Contractors for new operations or activities shall prepare a Safety Basis Report as part of design activities and shall submit the Safety Basis Report, and a description of the Management of Change process to DOE for review and obtain DOE approval of these documents prior to initiation of a new hazardous chemical operation or activity in a new or existing facility.
  - (2) For existing operations or activities, Contractors shall establish a schedule in their ISM System Description for compliance to the requirements of this Order.

#### **4.5.4 Approvals**

The approval of the documents required by this section shall be the responsibility of the Site DOE Office and shall be based on an affirmative determination that the documents meet the requirements of this Section and provide reasonable assurance of adequate protection of the public, the workers, and the environment.

#### **4.5.5 Updates**

The Safety Basis Report shall be reviewed, updated (if necessary) and every five years following the first submittal and approval. Significant changes shall be updated immediately. If no changes are necessary, a letter report certifying this to be the case should be submitted to DOE.

A special thanks is extended to Dick Englehart and those who have provided him comments to date. As stated above, Dick is still taking comments on this proposed new section.

Dick Englehart and Rich Stark of EH-31 have been investigating whether or not DOE O 440.1A, "Worker Protection Management for DOE Federal and Contractor Employees," already addresses the concerns of this issue. We are in the process of reviewing the order and the associated guides. In addition, we scheduled a review briefing of these documents on April 20, 1999 in Germantown. Terry Krietz, the EH-5 project officer for this order, gave the briefing. Team members were invited to attend. The team needs to determine where the Chemical Safety Guide would be most effective, under facility safety or worker safety programs.

To reemphasize, we need the Issues 1-1 sub-team as well as other interested CSIG team members to comment on the overall approach outlined above and to provide me with suggestions for what should be

addressed by the guide. The identification of Cognizant Secretarial Offices (CSOs) and line representatives having vital interest in such a guide is also requested.

Below, please find Ken Murphy's (since retired) first attempt at a guideline outline:

The body will have short descriptions of recommended elements of chemical safety management. The appendices will provide detailed information and examples of how a management element might be implemented.

<b>Scope and purpose of Guide</b>
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Adaptation of this chemical safety guidance into a site's ISM System  
Tailoring philosophy – practical, focus on work, improve effectiveness, etc  
Emphasis on Chemical Industry best practices

Key elements of the guide might include (some of this came from draft Y-12 material, thanks David, plus some incomplete thoughts of my own):

***Work Description and Planning***

- A work plan that details the work and its evolutions, and provides operations information and safety review needs.
- A change control process that flags changes in personnel, facility configuration, operations design and procedures, operational requirements, and technology that signals the need for further hazards analysis and staff attention.

***Hazards Analysis***

- A hazard evaluation to identify potential accidents and evaluate structures, systems, components, and controls relied on for safety.

A variety of hazard evaluation tools and capabilities (trained personnel) should be available. Tools include: Preliminary Safety Walkthroughs; Risk Mapping; Facility Hazards Analysis; Job and Task Hazards Analyses; Transient Work Analysis; and methods for timely analysis of unaddressed hazards when discovered.

***Implementation of Appropriate Controls***

- Appropriate evaluation and implementation of the findings and recommendations of hazards analyses, and of ES&H concerns raised by employees and the public.
- Training measures to ensure that personnel whose actions are relied on for safety are appropriately trained to perform their safety functions.
- Procedures developed and implemented to enable personnel who are relied on for safety to effectively carry out their duties.
- Quality assurance measures to ensure that items relied on for safety and measures used to ensure their continuous availability and reliability are of sufficient quality.
- Inspection, test, and maintenance measures to ensure the continuous availability and reliability of all hardware, tools, and personal protective equipment relied on for safety.

#### Documentation Needs and Requirements

- Records that document safety program activities are kept current and maintained for the life of the facility.
- The Non-Nuclear Equivalents of Work Authorization Processes and Authorization Basis Documents Related to Chemical Activities

#### Conduct of the Work

- Implementing a written process to confirm readiness to perform the work
- Work supervision to ensure that work is performed according to the approved work plans

#### Feedback, Lessons-Learned, and Continuous Improvement

- Periodic audits and assessments to ensure that operations are being conducted safely
- Investigations of operational events to prevent recurrence and ensure that they do not lead to more serious consequences.

#### Issues and Concerns

- Should we use nuclear terminology, e.g., authorization basis documents, or make up new terms?
- If we produce a guide only and not a mandatory “driver” how will the guide be used?
- Should scope be “chemical safety” or “chemical process safety”, or both ... are we just concerned with the “gray” area of less than TQ values?

#### References (to be provided)

- DOE Order 5481.1B
- 1997 Draft Notice on Non-nuclear Facility Safety Analysis (Never Issued)
- DOE STD-3009-94
- The Oak Ridge Y-12 PSM Approach
- The 2 DOE Chem Safety Handbooks and one HAZOPS example document, see our web page
- Applicable CCPS Guides
- HASP documents and requirements (OSHA 1910.120 (b)(4)(ii) and EM Limited Technical Standard: SAFT 0025 “HASP Guidelines”)
- Others ...team please identify and provide.

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Active team members are requested to add appropriate management officials in their organizations to whom status information would be provided and whose support is needed to make available team member's time. On 13 May 1999, the Secretarial Officer's Working Group (SOWG) was briefed by Dick Englehart and George W. Schlossnagle on these issues. An appeal was made to get the endorsement of the group and to get SOWG to recommend to line management that they take a more proactive role in chemical safety management as encouraged by the DNFSB.

**Interactions with, & Assistance from Others:**

*To Be Determined....*

**Schedule of Deliverables, Decision Points:**

<b>Deliverables</b>	<b>Proposed Dates</b>
Draft Proposed Approach	<b>6/99</b>
Final Approach	<b>7/99</b>
CSO Approval of Outline	<b>8/99</b>
Draft Guide	<b>11/99</b>
Final Coordinated Guide	<b>08/00</b>

**Decision Points:**

In May and June of 1999, during phone conferences and the SA'99 EFCOG meeting in Portland, we need to decide upon the direction of this effort. The question is how should we produce this guide and whether or not it should be a guide under DOE Orders for Facility Safety (420.1) and Worker Safety (440.1A).

**Issue A.2 (Original 8-1):****Integrating Chemical Safety and Nuclear Safety -- Relevance of TSRs or TSR-like controls for chemical hazards in nuclear or non-nuclear DOE facilities.****Champion:**

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***Description of Issue:***

There are adequate DOE directives and guidance for contractors to identify hazards and develop / implement hazard controls in DOE nuclear facilities. However, DOE's requirements and guidance is lacking for non-nuclear/ chemical/toxicological hazards due in large part to the cancellation of DOE Order 5481.1B, "A Safety Analysis and Review System".

Some DOE field offices have retained DOE Order 5481.1B in their contracts while others have allowed the contractors to identify what is required through the S/RIDs, Work Smart Standards, or ISM processes. It is stated in DOE P 450.4, Safety Management System Policy, that "...Before work is performed, the associated hazards shall be evaluated and an agreed-upon set of safety standards and requirements shall be established which, if properly implemented, will provide adequate assurance that the public, the workers, and the environment are protected from adverse consequences...." While the ISM directives and guidance documents do establish the basic requirements for identifying hazards and developing controls, they do not provide the degree of detail that many people feel are necessary to uniformly implement these requirements across the DOE complex for non-nuclear hazards.

There is not a uniform position within DOE Complex on controlling non-nuclear/ toxicological hazards. On a national level, DOE's toxicological hazards are very small in comparison to other industries. In addition, there is no industrial or regulatory precedent for Safety Class (SC) designation of SSCs in facilities or processes with only toxicological hazards. However, this position does not exclude or differentiate treatment of toxicological hazards from the hazard analysis activity in nuclear facilities.

Some related issues are as follows:

- Should we apply nuclear guidance to non-nuclear portions? (e.g., level of controls, level of safety documentation, etc.)
- Is a Safety Class SSCs required for chemical hazards that may challenge the public?
- Should we have TSRs for chemical hazards in nuclear facilities? If so, should Price-Anderson Act apply to violations of TSRs for chemicals?
- What type of authorization basis documents, such as evaluation criteria, functional classification, etc. for non-nuclear facilities?
- Should we develop a USQ-like process for non-nuclear facilities?
- How should we treat a combined release of chemical and nuclear materials?

It was suggested during the Joint DOE and EFCOG Chemical Safety Workshop that a regulatory driver in the form of a DOE standard or guidance should be developed to deal with the non-nuclear/toxicological hazards in the DOE authorization basis.

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*[Active team members are requested to add appropriate management officials in their organizations to whom status information would be provided and whose support is needed to make available team member's time.]*

***Interactions with, & Assistance from Others:***

*To Be Determined*

**Assistance** from DOE Office of Nuclear Safety Policy and Standards  
and “buy-in” from EFCOG Safety Analysis Working Group/Authorization Basis Subgroup

**Interaction with** and “buy in” from DOE DP, ER and EH and DOE Field Offices

***Schedule of Deliverables, Decision Points:***

**Deliverables:**

- Task Plan and Milestones
- Formation of a working group
- DOE Standard or Preparation Guide for Chemical Safety/Hazards Analysis

**Schedule and Decision Points:**

*To Be Determined....*



## **Issue Set B: Chemical Safety Management Issues and ISM**

### **[Original Issues 6-1 + 10-1]**

#### **Issue B.1 (Original 6-1):**

**Common Threads and Lessons Learned in Recent Chemical Occurrences and Identified Vulnerabilities -- Ensuring that all Significant Chemical Safety Vulnerabilities have been Identified and Addressed.**

#### **Champion:**

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#### ***Description of Issue:***

The DOE Chemical Safety Vulnerability Report of 1994 identified numerous generic and site-specific vulnerabilities, and required Management Response Plans from sites in the DOE defense nuclear complex. Various chemical and radiological occurrences since then, including the May 14, 1997 chemical explosion at Hanford's Plutonium Reclamation Facility (PRF), indicate that significant chemical safety vulnerabilities persist within the DOE complex. In response to the PRF accident, the Secretary of Energy issued several directives requiring numerous Field Office actions. One of those directives, the August 4, 1997 memorandum, "DOE Response to the May 14, 1997 Explosion at Hanford's Plutonium Reclamation Facility," was directed at requiring all DOE sites to reassess known chemical and radiological vulnerabilities and to evaluate for new vulnerabilities on a continuing basis. In response, many sites completed extensive assessments and walk-downs, and disposed of significant amounts of unneeded hazardous chemicals.

While the Secretary's PRF followup initiative clearly accelerated the progress towards eliminating certain vulnerabilities, the attainment of the goal to identify, characterize, and satisfactorily address all significant chemical safety vulnerabilities is a challenging, ongoing process, especially at the larger DOE sites. The major roadblocks are the size of the problem (e.g., thousands of tanks and hundreds of miles of associated piping); technical issues (e.g., unique, complex, poorly known chemical mixtures stored in aging equipment); competing priorities; and limited resources.)

#### ***Issue B.1 (6-1) Champion and Team Members:***

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***Approach, Schedule of Deliverables, Decision Points:***

The overall approach is to develop a guidebook, which incorporates the best elements of vulnerability assessments and related efforts (e.g., protocols, methodologies, surveillance practices, prioritization schemes, and tracking and reporting systems) that were undertaken at various DOE sites as part of the 1994 Chemical Safety Vulnerability Study or the 1997 Secretarial initiatives following the chemical explosion at PRF. The guidebook is intended to provide a systematic protocol for assessing vulnerabilities, along with whatever necessary criteria, guidelines and methods. The appropriate application of the protocol and methodology suggested in the guidebook throughout the DOE complex would help ensure that chemical vulnerabilities are adequately identified, analyzed, and addressed.

A starting point for this work is the protocol and methodology developed and applied at Hanford, which was briefly discussed at the Joint Chemical Safety Issues Workshop, Albuquerque, NM, in November 1998.

The draft outline for the guidebook is given below:

- Introduction (background, purpose, approach, and definitions)
- Scope and Process (vulnerability assessment scope, protocol, process steps)
- Assessment Methodology (data collection, review criteria, and analysis)
- Hazard Ranking and Prioritization of Corrective Actions
- Reporting and Tracking of Vulnerabilities
- Appendix on sample applications (e.g., vulnerability assessment at Hanford)

***Schedule of Deliverables:***

**Deliverable:** A guidebook for vulnerability identification, assessment, prioritization, reporting and tracking.

***Schedule:***

Working Draft Guidebook (partially drafted or annotated sections) — June 30, 1999

Preliminary Draft Guidebook (all sections, with team inputs) — September 30, 1999

Final Draft for CSIG review and comment — November 30, 1999

***Decision Points***

To be determined, as necessary

***Interactions with, & Assistance from Others:***

**Assistance:** Will be needed to publish and distribute the proposed guidebook.

**Interactions with Other Organizations:** The proposed guidebook would be of interest to the nuclear fuel-cycle industry, the American Nuclear Society, The U.S. Nuclear Regulatory Commission, the Chemical Manufacturers' Association, and other organizations.

This issue is naturally related to other issues identified at the Workshop (e.g., giving the right priority to chemical safety issues, integrating nuclear and chemical safety, management of safety basis issues, etc.

## **Issue B.2 (Original 10-1\*):**

**Chemical Life Cycle Management and Best Practices --Validate the Draft Chemical Management System Guide on the Chemical Safety Web Site  
[\*combined with original 10-3, "Define Stages of Life Cycle Management"]**

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### ***Description of Issue:***

Within the Department of Energy (DOE) Complex there exists myriad operations with different missions, complexity, and associated hazards. All of these operations, to some extent involve the acquisition, use, storage, and final disposition of chemicals. Recently, DOE Headquarters issued for review, a guideline for the management of chemicals, based on the Hanford Site Chemical Management Requirements. There is a need for the DOE complex to perform a thorough review of this guideline to assure its applicability, relevance, and adequacy if it is to be applied across the board.

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The team members line management will be identified in the future, as applicable, to assure adequate dissemination of information, line management support, and funding.

***Interactions with, & Assistance from Others:***

*To Be Determined*

**Assistance:**

This activity is by design, a joint effort among participants from DOE and the contractors from the various DOE sites. The results of this activity are identified within section 4.0. It is assumed any revision to the DOE guidelines for chemical management resulting from this activity will incorporate the recommendations from DOE, line management, and other contractor staff.

**Interactions with Others:**

Interactions with other applicable and relevant organizations will be identified, as applicable.

***Schedule of Deliverables, Decision Points:***

**Deliverables:**

The review of this guideline will result in the following deliverables:

- A recommendation on the intent and usage of the DOE guideline
- The clarification between a chemical management plan and a chemical management system
- Validate the appropriateness of the various elements of the guideline and whether it is at the appropriate level to allow implementation at the DOE complex across the board
- A joint contractor and DOE revision of the guideline to set forth a recommended approach to chemical management

**Schedule of Deliverables:**

*To Be Determined*

**Decision Points:**

*To Be Determined*

<p><b>Issue Set C: Chemical Safety Best Practices and Lessons Learned</b> <b>[original issues 3-1 + 4-1+ 5-1 + 8-2 + 10-2]</b></p>
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**Issue C.1 (Original 3-1):**

**Chemical Safety in Laboratories -- Defining the latitude of the unassisted Principal Investigator (PI) to analyze hazards and select controls.**

**Champions:**

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***Description of Issue:***

Each lab would operate within an envelope. The basic envelope would be the precautions specified by the

applicable CHP for that lab. The Principal Investigator (PI) would be free to analyze hazards and select controls if the following are avoided:

- **Working with volatile materials with Occupational Exposure Limits <<50 ppm (from OSHA 1910.1450, Appendix B)**
- **Working with solids with Occupational Exposure Limits <<50 micrograms per cubic meter, if aerosolized (PEL for Pb and Cd are 50 micrograms per cubic meter; for comparison that for Cu is 200 micrograms per cubic meter)**
- **Toxic hazards, TLV <<5 ppm (TLV-C for HCl), LD50 <<20 mg/kg (from HMIS health = 4), or LC50 <<50 mg per cubic meter [0.05 mg/l kg (from HMIS health = 4)]**
- **Reproductive hazards, teratogens, embryotoxins (from OSHA's requirement for additional precautions and various CHPs)**
- **Carcinogens (As above)**
- **Mutagens (by analogy to carcinogens)**
- **Moderate or high chronic toxicity (from .1450, Appendix A)**
- **High acute toxicity (As above)**
- **Pyrophoric**
- **Flash point <<0 deg. F (Flash points for ether, -49 deg. F, and gasoline, -50 deg. F, <<0 deg. F)**
- **Readily peroxidizable (this is available, the list would need to be disseminated)**
- **Water reactive**
- **Aerosolization of a solid or liquid by grinding, cutting, vaporization, etc.**
- **Substance governed by an OSHA substance specific registration or a state law or regulation for a specific chemical.**
- **NFPA or HMIS rating of 4 for health or reactivity**
- **Working in a confined space**
- **Voltage >600 V (common definition of high voltage where skin resistance is overcome)**
- **Radionuclide**
- **Pressurized air or gas >100 psig**
- **Liquid quantity IN USE at any time >5 gallons, other than water; liquid quantity IN STORAGE at any time >25 gallons, other than water.**
- **Scaling up quantity in use by 5 or more times.**
- **New type of instrumentation to obtain a Job Hazard Analysis**
- **Burning or pyrolyzing materials**
- **Any other known highly hazardous condition**

General CHP precautions would apply in other circumstances. If any of these conditions were found, then additional precautions would be specified by agreement between the experimenter and her/his ES&H people. Then the precautions for that lab would become the universal precautions specified in the CHP plus the special ones for the specific hazards not already covered and the envelope for that lab would be the operations allowed by the revised precautions.

Introducing more hazards not covered by the universal precautions and subsequent changes would require revising the precautions for that lab/changing the envelope.

At LLNL, this can be done by revising Safety Procedures or Hazard Assessments. At other places it could be accomplished by revising CHPs or the equivalents to Safety Procedures. A Safety Procedure is a document that specifies responsible parties, describes hazards, describes controls, and provides other supporting information. A Hazard Analysis is used to meet 29CFR1910.132 requirements for documenting why PPE is issued, but includes a place where all controls, such as engineering controls and safety showers/eyewashes, are listed.

***Issue C.1 (3-1) Champions and Team Members:***

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***Interactions with, & Assistance from Others:***

*To Be Determined....*

***Schedule of Deliverables, Decision Points:***

*To Be Determined....*

**ISSUE C.2 (Original 4-1):**

**Chemical Information Management and Lessons Learned -- Need for Recommended "Best Practices" for a Chemical Management System with a Supporting Business Plan that Demonstrates Cost Effectiveness.**

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***Description of Issue***

As a part of the discussion during the November 1998 Chemical Safety Workshop on access to chemical safety and lessons learned information, the breakout group was concerned about the lack of a recommended, best practice, chemical management system. The group was concerned that all the components of a best practice management system would not be identified by some elements within the DOE complex.

In addition, after the best practice is identified, those professionals responsible for the health and safety program and mid-level line management would have the task of convincing senior line management that the program is needed and should be supported. To achieve this, the group believed that a recommended chemical management system should be accompanied with a supporting business plan that demonstrates the financial value of implementing the program. This business plan should demonstrate, on a dollar basis, the value of implementing a recommended chemical management system.

### ***Deliverables***

A proposed approach to resolving the issue consists of capturing and institutionalizing the best elements of chemical safety management, e.g., a directory of supporting elements which can be used by DOE field elements to ensure all components of a best practice system is identified. In addition, for each element or groups of elements, a business case needs to be developed which will demonstrate the financial advantages of implementing the practice.

The deliverables are expected to be guidelines that can be published and presented at an appropriate forum.

The protocol and approach recently developed and applied at Hanford, which was briefly discussed at the Joint Chemical Safety Issues Workshop, Albuquerque, NM, November 1998, could provide a starting point for this work. In addition, the draft chemical management system discussed in under Issue 10 should be consulted. Issue 10-1, Championed by Bill Adair, FDR, Richland, WA, may be closely related. As such, Bill Adair and his team should be regularly consulted during this effort. In addition to sources within DOE, the chemical industry should be consulted. This can be achieved through the Chemical Manufacturers Association (CMA) and the Center for Chemical Process Safety (CCPS).

Specifically, CCPS is in the process of developing the business case for implementing a chemical management system. We should participate with this CCPS effort.

(All team members and other interested people are most welcome to comment and suggest ideas for consideration.)

### ***Issue C.2 (4-1) Champion and Team Members:***

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### ***Interactions with, & Assistance from Others***

Assistance will be needed to publish and distribute the proposed guidebook and to implement recommended management procedures.

### ***Decision Points***

*(To be determined, as necessary)*

### **Issue C.3 (Original 5-1):**

#### **Chemical Safety in Work Planning -- Draft Checklist/Guidance Document for Chemical Safety in Work Planning.**

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#### ***Description of Issue:***

Within the DOE complex, a chemical injury or exposure occurs once a month. This experience indicates that work planning, control, and execution still have problems in the area of chemical safety. Chemical hazards are often subtle and require a high degree of experience and training to identify and control. Guidance is needed to help planners and workers recognize and understand not only chemical hazards associated with the immediate task activities but also those interfacing hazards from the equipment and facility that may affect the work. A "work-in-progress" Chemical Work Planning (CWP) guide has been drafted to serve as a frame-work for discussion and improvement and has been posted on the EH-5 website for review and comment. It follows much of the format and adopts many of the features of the Hanford Automated Job Hazard Analysis User's Guide that applies to all hazards including chemical hazards. The CWP guide also incorporates best practices on chemical safety from the Rocky Flats' Job Hazard Analysis and the Job Hazards Checklist approach used by Idaho.

The purpose of this committee is to develop a model CWP guide to assist DOE sites in developing their own guides for controlling onsite chemical hazards in work activities or in performing "gap analysis" on their work planning process to improve their job hazard analysis and hazard control. This would be done by members of this committee familiarizing themselves with work planning practices at their respective facilities to provide "best practices" for the guide and by working within the committee to generate ideas to improve the guide. This includes committee members working with their site / other chemical safety personnel to help further develop the draft checklist of questions and guidance information to trigger further analysis and involvement of chemical experts.

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- Other team members need to identify their line management.

***Interactions with, & Assistance from Others:***

*To Be Determined....*

***Schedule of Deliverables, Decision Points:***

**Deliverables:**

*To Be Determined....*

Final Product will be a model chemical work planning document to be placed on the EH-5 website that incorporates the experience, best practices, and lessons-learned from participating DOE sites including private industry.

**Schedule and Decision Points:**

*To Be Determined....*

#### **Issue C.4 (Original 8-2):**

### **Integrating Chemical Safety and Nuclear Safety -- Handling the Combined Consequence of Chemicals, or the Combination of Chemicals and Radionuclides.**

#### **Champion:**

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#### ***Description of Issue:***

Emergency planning, hazard assessment, and safety analysis of Department of Energy (DOE) facilities require consideration of potential exposures to mixtures of chemicals, as well as mixtures of chemicals and radionuclides, released to the atmosphere. The consequences of simultaneous exposure to several radionuclides have routinely been added by summing the radiation dose for each radionuclide present. In the past, unlike radionuclides, the consequences of each chemical have been analyzed separately. This approach is not conservative, and may not adequately protect the health of persons exposed to mixtures.

Exposure to chemical mixtures may lead to additive, synergistic, or antagonistic health effects. Default recommendations for use in emergency management and safety analysis within the DOE complex where potential exists for releases of mixtures of chemicals has been developed. Methodology for application of these recommendations has also been developed. A paper describing these methodologies has been accepted for publication in the journal Applied Occupational and Environmental Hygiene. This describes the default methodology that has been developed for the analysis of the consequences of exposure to mixtures of chemicals for DOE's subcommittee on Consequence Assessment and Protective Actions (SCAPA). A copy of this paper is available below<sup>1</sup>.

A similar document was developed by the EFCOG-SAWG Nonradiological Hazardous Materials Safety Analysis Subgroup (NHM), and was included in the packet of deliverables that was distributed in June 1996. This NHM deliverables packet also included a document describing the "Differences between chemical and radiological risk guidelines and consequence calculations". A copy of this document is also available below<sup>2</sup>.

<sup>1,2</sup> The references below are available from the Champion for Issue C.4. Reference #1 will appear in the September 1999 issue of the journal. Reference #2 is available in hard copy only. It can be faxed and sent on an individual basis)

<sup>1</sup> Craig, D.K., Baskett, R.L., Davis, J.S., Dukes, L.L., Hansen, D.J., Petrocchi, A.J., Powell, L.L., Sutherland, P.J., and Tuccinardi, T.E. Jr.: Recommended Default Methodology for Analysis of Airborne Exposure to Mixtures of Chemicals in Emergencies. Applied Occupational and Environmental Hygiene, In Press.

<sup>2</sup> EFCOG-SAWG Nonradiological Hazardous Materials Safety Analysis Subgroup Deliverable: Differences between Chemical and Radiological Risk Guidelines and Consequence Calculations. In "ECS-CAT-96-0054: Guidelines Developed for Analysis of Chemical Exposures, June 17, 1996".

#### ***Issue C.4 (8-2) Champion and Team Members:***

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*[Active team members are requested to add appropriate management officials in their organizations to whom status information would be provided and whose support is needed to make available team member's time.]*

***Interactions with Other Organizations:***

- Interactions with professional societies, such as the Health Physics Society, ACGIH, AIHA, and/or the Society for Risk Analysis, have been suggested.
- Chemical Manufacturer's Association and the Center for Chemical Process Safety.
- Little of use will evolve from this effort without a concerted effort on the part of DOE-EH to involve other DOE department, especially DOE-DP, DOE-EM, DOE-ER, and DOE-NN. DOE-NN, the sponsor for SCAPA, is already "on board".

***Schedule of Deliverables, Decision Points:***

***Deliverables:***

Default recommendations for use in emergency management and safety analysis within the DOE complex where potential exists for releases of mixtures of chemicals has been developed. Methodology for application of these recommendations has also been developed. A paper accepted for publication in a peer-reviewed journal is available<sup>1</sup>. A document prepared by the EFCOG-SAWG NHM subgroup, "Differences between chemical and radiological risk guidelines and consequence calculations"<sup>2</sup>, is also available.

A path forward to facilitate implementation throughout the DOE complex of these default methodologies for analyzing exposure to mixtures of chemicals needs to be developed. Exactly how the consequences of simultaneous exposure to radionuclides and chemicals should be handled still needs to be determined. Exposure to either may exacerbate the health consequences of the other. However, radiological risk guidelines are very low in terms of health consequences by comparison with chemical risk guidelines. Unless accidental radiation doses exceed current guidelines substantially, simultaneous or consecutive radiation exposure should not have a significant additive effect to the consequences of chemical exposures. Caution needs to be exercised when exposures involve the inhalation of particulate material, since powerful synergistic effects have been observed when particles provide a vehicle for transporting significant quantities of adsorbed chemicals into pulmonary regions of the respiratory system.

**Schedule of Deliverables:**

*To Be Determined*

**Decision Points:**

- Identifying the levels at which radiological dose is **not** a factor (e.g., additive) with chemical exposures.
- Methodology to be used with high radiation doses which may have an impact on the consequences of simultaneous or consecutive chemical exposures.
- Creation of a data base similar to that of TEELs (which provides health effect-related concentration-limits for a large number of chemicals for which AEGLs or ERPGs do not yet exist), which provides the information (target organ health effects using health code numbers [HCNs]) required to implement the mixture methodology. HCNs have been developed for about 760 chemicals to date.
- A replacement for the inadvertently cancelled DOE Order 5481.1B is long overdue. This replacement guidance must include consideration of the consequences of exposure to mixtures of chemicals, and the combined effects of simultaneous or consecutive exposure to Chemicals and radiation.

<p><b>Issue Set D:      Chemical Safety Information Resources Management</b> <b>[Original Issues 7-1 + 9-1]</b></p>
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**Issue D.1 (Original 7-1):**

**Improved Access to Technical Information on Chemical Reactivity and Incompatibilities**

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***Description of Issue:***

Information and guidance on reactive chemical hazards and incompatibilities are not always adequate / readily available at DOE facilities. This situation could be improved by sharing resources and expertise among the DOE facilities and sites. Many sites have chemical experts with knowledge / experience that experts at other sites may not have, and vice versa. Lessons-learned for facility-specific chemical hazards are sometimes not shared within the same site and often not disseminated beyond the site having the information. There is a need to capture and share this knowledge and expertise. This is particularly important should the experts leave or retire without documenting knowledge / expertise that is important in the identification and analysis of chemical hazards. There is a need for the DOE community to collect all data on chemical hazards / reactions that the DOE consider to be significant chemical safety information

The purpose of this committee is to provide DOE facilities / sites with general guidance and information on reactive chemical hazards and incompatibilities. This would be done by working with the field elements' chemical experts (being identified by the Issue 7-2 Committee on Lack of Identifiable Technical

Personnel) in collecting, analyzing, and interpreting available data on chemical hazards to provide lessons learned to all DOE facilities / sites and to help improve effectiveness of chemical safety programs. The information and guidance includes DOE facility-specific chemical hazards, hazardous / reactive chemicals unique to the major DOE facilities, and information and lessons-learned for other hazardous chemicals that, in the opinion of the DOE experts and members of this committee, are significant and deserve more attention.

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*[Active team members are requested to add appropriate management officials in their organizations to whom status information would be provided and whose support is needed to make available team member's time.]*

- For Billy Lee: George Schlossnagle, EH-52 Chemical Safety Team Leader, 19901 Germantown Rd, MD, 20874 Phone: 301-903-9418 Fax: 301-903-7773 e-mail: [george.schlossnagle@hq.doe.gov](mailto:george.schlossnagle@hq.doe.gov)
- For Dave Quigley: Robert Marcinko, P.O. Box 1625, Idaho Falls, ID, 83415-4129 Phone: 208-526-3590 Fax: 208-526-8053 e-mail: [rmarcink@inel.gov](mailto:rmarcink@inel.gov)
- Other team members need to identify their line management.

***Interactions with, & Assistance from Others:***

*To Be Determined....*

***Schedule of Deliverables, Decision Points:***

**Schedule and Decision Points:**

*To Be Determined*

**Final Product:** The compilation of information and lessons-learned on special chemical hazards for DOE facilities/sites. Guidance on EH-5 web-site addressing special chemical hazards.

## **Issue D.2 (Original 9-1/9-2):**

### **Establish a “Clearinghouse” Network of Requirements Information [A Road-map of Chemical Safety Requirements]**

#### **Champions:**

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#### ***Description of Issue:***

The DOE Management Response Plan, prepared in response to the 1994 Chemical Vulnerability Study Working Group Report referred to the lack of specific guidance from DOE as a reason for not addressing known deficiencies in environment, safety and health chemical safety programs. The Management Response Plan called for DOE assistance to the field organizations in integrating DOE, EPA and OSHA requirements related to chemical safety, and specifically called for development of a "road-map" for chemical safety to be provided to DOE sites, that clarifies existing requirements and compliance objectives and provides guidance in achieving them. The DOE complex has a wide variety of operations, ranging from R&D environments to D&D environments. The issue being addressed by this team is whether or not such a road-map of requirements is still needed by the sites to facilitate the determination of the legal and regulatory requirements that apply to any given type of operation based on the hazards present.

The goal of this team is to establish a clearinghouse of information, approaches and tools that are already in use within the DOE complex to facilitate the identification and implementation of regulatory requirements for chemical safety. This clearinghouse will identify and describe existing models, systems and approaches, will facilitate the exchange of information. All of the programs, tools, and other approaches compiled will be made readily available to individuals interested in seeing what others are doing to identify and consolidate chemical safety requirements applicable to their work.

#### ***Issue Champion and Team Members:***

##### **Champions:**

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#### ***Line Management Contacts:***

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- For Gail Kleiner: George Schlossnagle, EH-52 Chemical Safety Team Leader, 19901 Germantown Rd, MD, 20874 Phone: 301-903-9418 Fax: 301-903-7773 e-mail: [george.schlossnagle@hq.doe.gov](mailto:george.schlossnagle@hq.doe.gov)

***Interactions with, & Assistance from Others:***

*To Be Determined...*

**Assistance:** EFCOG and DOE report to DOE sites that they are developing a clearinghouse of requirements-based tools for managing chemical safety for the mutual benefit of all DOE sites and request that sites having such tools make them available via internet site addresses, electronic form, etc.

**Interactions with Others:** May interact with any site willing to share or needing a method to determine what requirements apply to a given hazard or operation. Expect to interact regularly with EH-52 Web-master to set up links from tools to the DOE Chemical Safety Home Page.

***Schedule of Deliverables, Decision Points:***

*To Be Determined....*

**Deliverables:**

Establish a Clearinghouse of information, approaches and tools that are being used within the DOE complex to facilitate the identification and implementation of regulatory requirements for chemical safety. Include programs, lists, inventories, and other relevant tools involving regulatory requirements and best practices for managing chemical safety.

- Set up a web-based bulletin board that allows for the posting of descriptions of various models, systems and approaches to gathering and interpreting chemical safety requirements information (establish a point of contact for each DOE site interested in participating );
- Establish a users group that will allow for the exchange of ideas, notification of new approaches as they are identified, and discussion of approaches to the interpretation and implementation of new requirements as they arise.
- Evaluate the Clearinghouse inventory of the existing guidance currently being used within the DOE complex (i.e., tools, programs, lists) to provide the regulatory requirements and best practices needed for a comprehensive chemical safety program.
- Based on this evaluation, determine whether guidance providing a more systematic requirements road map is needed.
- If needed, determine whether this guidance should be operation based (i.e., D&D requirements, R&D requirements, etc.), or hazard based (i.e., lead, cadmium, chemical storage, etc.).
- All of the programs, tools, and other approaches compiled will be made available to individuals interested in seeing what others are doing to address this need.

**Schedule of Deliverables:**

*To Be Determined*

**Decision Points:**

*To Be Determined*

- Must decide when to stop trying to collect requirements-based tools and start evaluating their adequacy.
- Must determine whether a more systematic requirements road map is necessary.

## **DEFERRED NOVEMBER '98 PRIORITY ISSUES**

The following issues have been grouped as “deferred” and placed on “hold” until such time that their current or future Champions and Teams can take them on to completion or combine them with other issues that are under way or until they are deleted entirely from the work of the CSIG.

the work of the CSIG.

### **ISSUE 1-3: Use of Relative Risk when Incorporating Chemical Safety into ISM**

***Description of Issue:***

Chemical hazards should be evaluated using qualitative probabilities and consequences. The results of this analysis could then be used during ISM process to ensure that all participants are aware of how likely an exposure is and what the outcome of the exposure would be. This knowledge would help the chemical users and chemical risk acceptance decision makers to focus on risk minimization. This could then be used as a method of comparison for radiological and chemical consequences which would allow an opportunity for equal rigor in the evaluation of consequences of radiological and chemical scenarios.

***Issue 1-3 Champion and Team Members:***

**Champion:**

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## **ISSUE 3-2: Building Cooperative Relationships with Principal Investigators (PIs)**

### *Description of Issue:*

NONE SUBMITTED

#### **Champion:**

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## **ISSUE 4-2: Chemical Information Management and Lessons Learned --Use of lessons learned throughout the ISM cycle and integration into the work process.**

### *Description of Issue:*

NONE SUBMITTED

#### **Champion:**

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## **ISSUE 6-2: Communicating/exchanging technical information, controls, corrective actions regarding vulnerabilities.**

#### **Champion:**

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#### **Team Members:**

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### *Description of Issue:*

NONE SUBMITTED

**ISSUE 6-3: Addressing the loss of corporate knowledge.**

**Champion:**

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**Description of Issue:**

NONE SUBMITTED

**ISSUE 7-2/2-2\*: Identification and Use of Qualified Technical Personnel**  
(\*Issue 2-2, “Available Expertise” was combined with issue 7-2)

**Champion:**

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**ISSUE 8-3: Best Practices for Chemical Hazards Analysis.**

**Champion:**

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**Description of Issue:**

NONE SUBMITTED

**ISSUE 10-2:**

**Chemical Life Cycle Management and Best Management Practices --  
Chemical Best Management Practices**

**Champions:**

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**Description of Issue:**

NONE SUBMITTED AS YET...

**Issue C.5 (10-2) Champions and Team Members:**

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